



Power Xpert® 4000/6000/8000 Power Quality Meters

Product Focus



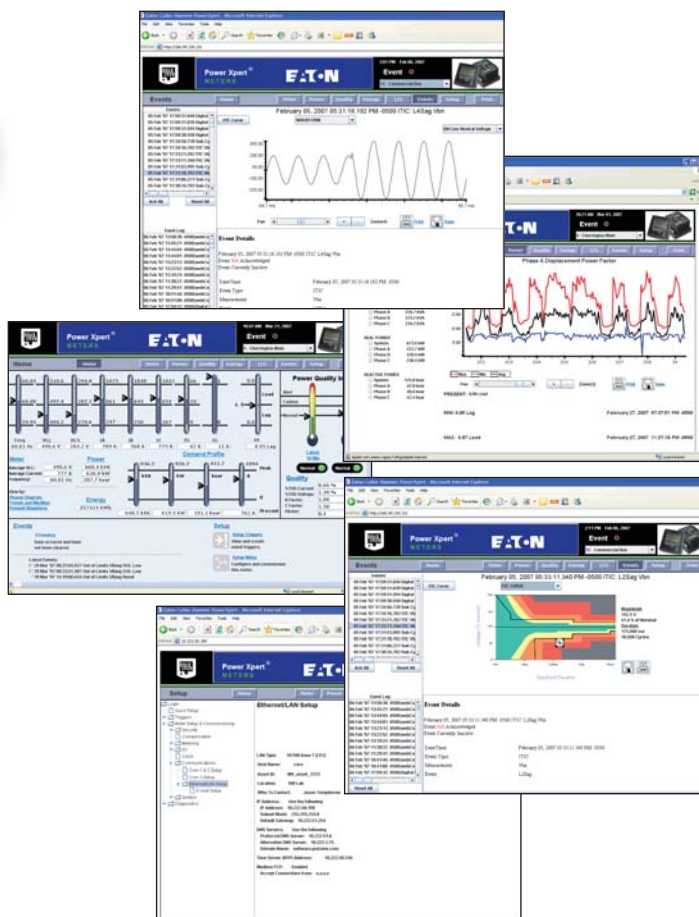
Detect sags, swells and harmonics in addition to comprehensive power measurements and logging. Capture high speed transients before they lead to equipment malfunction, damage or process failure.

Remotely access meters via Ethernet, analyze trend graphs and waveforms directly on your Web browser, or automatically send email notifications with waveforms attached.



Product Snapshot

- Internet enabled next generation power quality meter with comprehensive power measurement and integrated quality analysis
- Use a standard Web browser to surf to the meter and analyze waveforms, trend, ITIC (Information Technology Industry Council) graphs directly on the meter or LCD Display
- Capture waveforms at a high speed of 6 MHz (six samples every millionth of a second)
- Embedded ITIC performance curve analyzes the power quality events that have occurred and determines the level your sensitive IT equipment can sustain without disruption and damage
- Open protocols allow flexible third-party integration to BMS and other PQ systems
- 2007 Frost & Sullivan Power Quality Emerging Technology of the Year Award
- 2007 Product of the Year award winner by EC&M Magazine



Power Xpert 4000/6000/8000 Meters - Next generation power quality instruments

Innovative. Intuitive. Accurate. Accessible.

You can't manage what you can't measure, and you certainly can't measure something you can't even see, without a power quality instrument that is. Invisible and fleeting power disturbances can be silent killers—the electronic equivalent of high blood pressure. Eaton's Power Xpert 4000/6000/8000 meters represent a new genre of power quality instruments and comprehensive world-class power measurement and monitoring that reduce day-to-day operating costs and help avoid costly business interruptions.

The meters combine state-of-the-art technology with next generation ITIC diagnostics, waveform capture, data trending and performance benchmarking, along with a "Twist-and-Click" graphic display: a new paradigm for simplicity and ease of use in the market place. The embedded Web server enables users to surf to the meter over the Internet via a standard Web browser. The new platform offers advanced functionality like high-speed impulsive transient capture, 6 Mhz sampling rate (100 000 samples per cycle), anti-aliasing, ITIC analysis and automatic trigger setting, field-upgradeable firmware, memory expandable to 1 GB and optional digital, relay, solid state I/O.

Applications

Identify power quality problems

- Identify harmonics, sags, swells and transients damaging or disrupting sensitive, mission critical IT equipment
- Boost IT equipment service life to the maximum
- Analyze sequence of events up to one millisecond time resolution
- Protect motors from damage
- Preserve the integrity of processes and batches
- Prevent blown capacitor bank fuses
- Protect transformers and conductors from overheating

Detect and record high speed transients

- Avoid equipment damage and disruption
- Identify equipment malfunction

Monitor circuit loading

- Avoid overloads and nuisance overload trips
- Maximize equipment utilization
- Manage emergency overloads

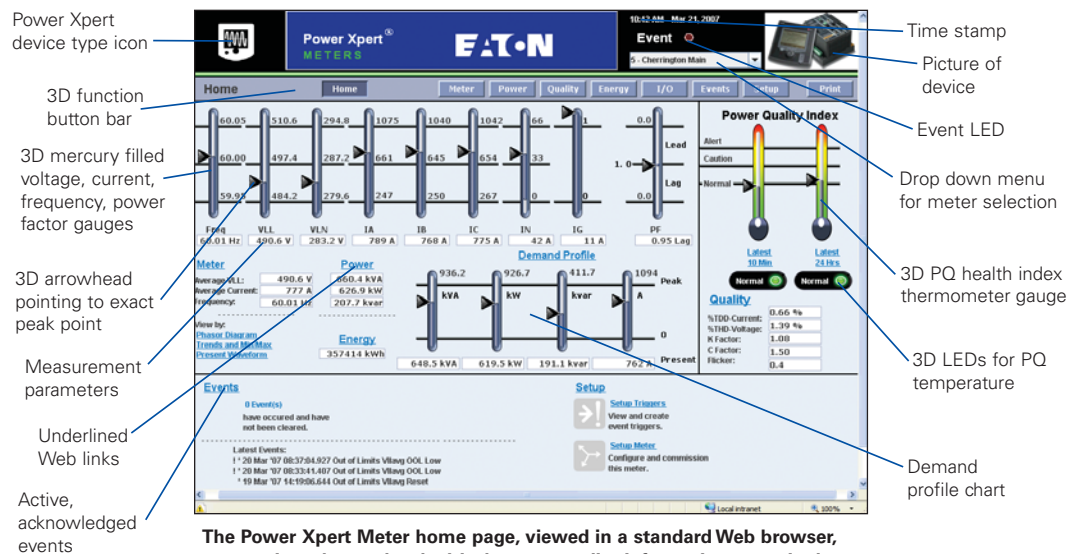
Manage energy utilization

- Reduce peak demand charges and power factor penalties
- Identify excessive energy consumption

Features and Benefits

- Embedded Web server - see and analyze waveforms, trends, harmonics directly in your Web browser or LCD meter graphic display
- Automatic power quality analysis and trigger setting with built-in ITIC performance curve: detect and capture sags, swells, transients, harmonics, flicker
- Accurately detect fast transients that previous generation monitors would miss, by assessing circuit activity at very high sampling rates (up to 100,000 samples per cycle)
- Comprehensive power, energy and demand measurements for 138 standard data points logged
 - Voltage, current: per phase minimum, maximum, average, trend graph analysis, export, print
 - Power: power factor, apparent, real, reactive, frequency
 - Energy, demand: forward, reverse, net, sum, TOU, profile, previous month comparison, graph analysis, export, print
- Up to one millisecond time synchronization and event logging capability for sequence of events analysis
- Get an at-a-glance view of power quality with patent-pending Power Quality Index gauge, statistically derived trending and red-yellow-green indicators for overall power health
- Support continuous, non-disruptive monitoring with a permanently installed meter
- Dramatically reduce the cost of monitoring power quality, compared to yesterday's specialized power quality instruments and consultants

- Alarm notifications are also available remotely via email with waveform attached
- Use industry-standard communication protocols, to support a multitude of configurations and third-party software: HTTP, FTP, Modbus RTU, Modbus TCP, SNMP, SMTP, NTP, COMTRADE
- 1 GB data storage capability
- Supported via Power Xpert Software and Power Xpert Architecture hardware components
- ANSI C12.20 accuracy



The Power Xpert Meter home page, viewed in a standard Web browser, summarizes the top level critical power quality information on a single page. Complex power quality data is presented in useful and simple graphical charts and gauges.

Standard. Enhanced. Premium. - Three flavors of power quality

- **The Power Xpert 4000** meter provides all the core functions for monitoring power consumption and power quality. This unit uses Delta Sigma technology to sample circuits at 1024 samples per cycle for extremely accurate measurement of harmonics, sub-cycle disturbance captures, power factor and harmonics.
- **The Power Xpert 6000** meter is geared towards the IT market by providing automatic trigger settings for IT equipment and plots events on an ITIC (Information Technology Industry Council) performance curve so they can be very easily analyzed. In addition this meter offers a patent pending Power Quality Health Index temperature gauge along with flicker calculations.
- **The Power Xpert 8000** meter adds the ability to capture very fast transients by sampling at 6 MHz—100,000 samples per cycle. That's a sample every 166 nanoseconds—six samples every millionth of a second, across three input channels as well as neutral-to-ground.

A world of difference in power quality analysis
1 millisecond time resolution – most accurate time available

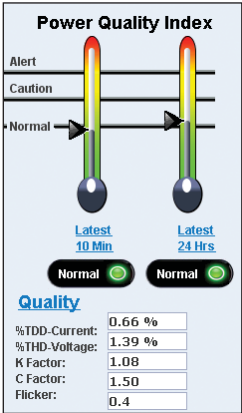
Harmonics, voltage fluctuations, transient overvoltage conditions and other power anomalies can wreak havoc on your equipment and processes. It is essential to fully understand the quality of the power that is being delivered throughout the facility. Detailed event information makes it possible to pinpoint the root causes of problems—or prevent them from occurring. With up to one millisecond time stamping accuracy available via GPS and IRIG-time sources, Power Xpert Meters register the sequence of events in a time-synchronized environment. Based on National Institute of Standards and Technology (NIST) atomic time, you can count on the most accurate time available. In the past, basic power monitors were used to identify existing conditions on an electrical distribution system or to evaluate past problems. If you wanted to detect fast voltage transients, you had to bring in portable power quality monitors that cost up to \$20,000 and usually required an outside consultant.

Built-in graphing - six samples every millionth of a second

Power Xpert 4000/6000/8000 next-generation meters redefine the art of measuring and monitoring power quality. Thanks to the latest technologies, these metering instruments are able to measure, trend, analyze and capture waveforms while serving web pages to users over the Internet, along with simultaneous FTP downloading and comma separated values (CSV) exporting capabilities. No matter if you are a PhD level power quality engineer or an IT system administrator, these instruments will provide you with the level of information you need, in an easy to understand graphical user interface at astonishing speeds of six samples every millionth of a second, if necessary.

Easy to use interface - demystifies power quality

In designing these power quality instruments, Eaton set out to demystify power quality—to take highly specialized data and convert it into useful information that doesn't require a power guru or consultant to understand. The result is an uncommonly easy-to-use interface and new graphical analysis of complex power quality data—delivered via email, over the Web and to third-party applications. With these capabilities, your power team can predict and prevent power quality problems before they lead to equipment malfunction, overheated circuits and system failure.



The patent-pending Power Quality Index measures the 'temperature' of your power quality. The gauges alarm levels are based on current TDD%, voltage THD%, K and C factors, flicker and ITIC events measurements.

1 gigabyte of storage capability - store and trend
5-10 years worth of data

Having enough storage capacity is a critical factor at this level of power quality instrumentation. How long can I store data locally on the power quality meter before the system will have to start overwriting previously captured information? A Power Xpert Meter has 512 MB of storage as standard and can be upgraded all the way to 1 GB. In a typical power quality environment this would provide storage capability for 5-10 years depending on the meter model.

Power Xpert 4000/6000/8000 meters estimated memory and storage capacity

with 512 MB standard and 1 GB optional CompactFlash

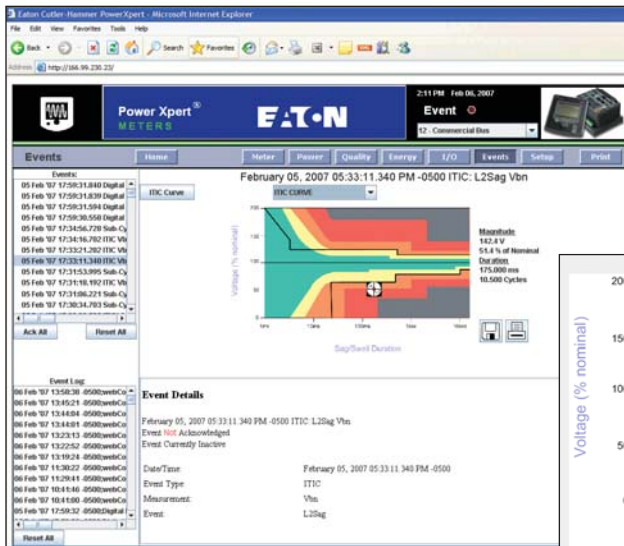
			Occurrence per month*		Memory Usage (MB)		Months of Capacity w/512MB CF**		Months of Capacity w/1GB CF***	
MODEL	EVENT	FILE SIZE (KB)	TYPICAL	SEVERE	TYPICAL	SEVERE	TYPICAL	SEVERE	TYPICAL	SEVERE
PX-4000	Sub-Cycle Disturbance	483	10	60	4.7	28.3	100	17	209	35
PX-6000	ITIC Event	483	5	20	2.4	9.4	200	50	417	104
	Sub-Cycle Disturbance	483	10	60	4.7	28.3	100	17	209	35
	ITIC and Sub-Cycle Disturbance combined	Total	15	80	11.8	66.0	40	7	83	15
PX-8000	ITIC Event	483	5	20	2.4	9.4	200	50	417	104
	Sub-Cycle Disturbance	483	10	60	4.7	28.3	100	17	209	35
	Transients	2048	3	30	6.0	60.0	79	8	164	16
	ITIC, Sub-Cycle and Transients combined	Total	18	110	13.1	95.2	36	5	75	10

* The typical and severe power quality event occurrences are estimates and may vary depending on the electrical environment.
** With 512 MB optional CompactFlash Card; memory is not allocated by event category; memory is used first come, first served.
*** With 1 GB optional CompactFlash Card; memory is not allocated by event category; memory is used first come, first served.

Built-in ITIC performance curve analysis

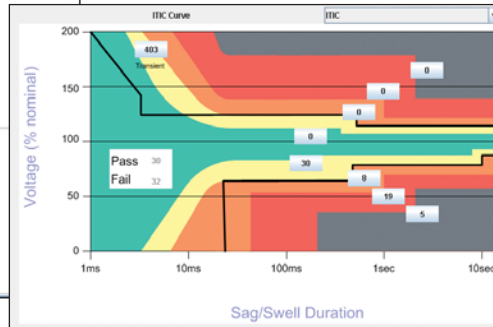
Takes the guesswork out of understanding the severity of IT power quality events

The ITIC (Information Technology Industry Council) curve describes how much (or how little) voltage your IT equipment can sustain without damage, over what length of time (nanoseconds to seconds). When you can plot power events in this broader context—relative to multiple variables—you can identify trouble that could cause damage or may be brewing. Of the few meters that can plot events on an ITIC curve, most require special software to do it. Eaton's Power Xpert 4000/6000/8000 meters require no special software. Right out of the box, these meters populate and display ITIC curves on both the local display and the Web interface.



ITIC curves

The Power Xpert 6000 and 8000 meter models automatically plot events on the ITIC curve. The user can drill down on any specific event and get information on where exactly the event hit and what was its magnitude and duration. With the optional Power Xpert Network Time Server, all events get time stamped at a 1 millisecond synchronized resolution.



The ITIC Web page includes counters to track the occurrence of disturbances and a pass/fail summary. In addition, selecting any disturbance counter links to a detailed event view of the disturbances in that ITIC category. Disturbance waveforms can be viewed from the browser.

Communications LED

Events LED

320 x 240 pixel backlit LCD graphic display

Back-button

Navigation control dial

Ethernet RJ45 configuration port

Display measurements:
Height: 9.0 inches (229 mm)
Width: 7.8 inches (198 mm)
Depth: 2.0 inches (51 mm)
Shipping weight: 2.1 lbs. (0.95 kg)

"Next generation power quality monitoring and management is now as easy as surfing to it with your Web browser or 'twist-and-click' on the LCD display!"

Communication Expansion Card

100F & 10/100 base-T Ethernet
Modbus TCP
Web server communications
Email on alarm, periodic data email
NTP time synchronization
RS-485 Modbus RTU port
RS-232 Modbus ASCII port

Digital I/O Card

8 digital inputs
2 solid state outputs
3 relay outputs

Configuration, display and Modbus card

Power input

Current transformer terminal

Auxiliary voltage terminal

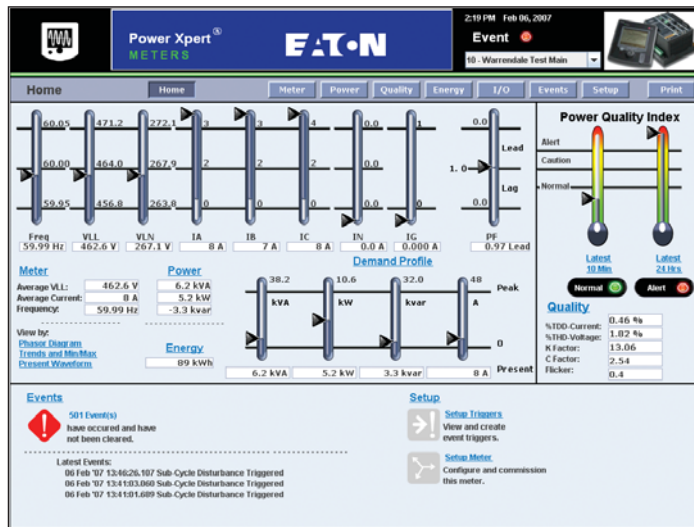
Voltage terminal

Meter module measurements:

Height: 8.2 inches (208 mm)
Width: 8.2 inches (208 mm)
Depth: 5.86 inches (without connectors, 149mm)
Shipping weight: 7.1 lbs. (3.22 kg)

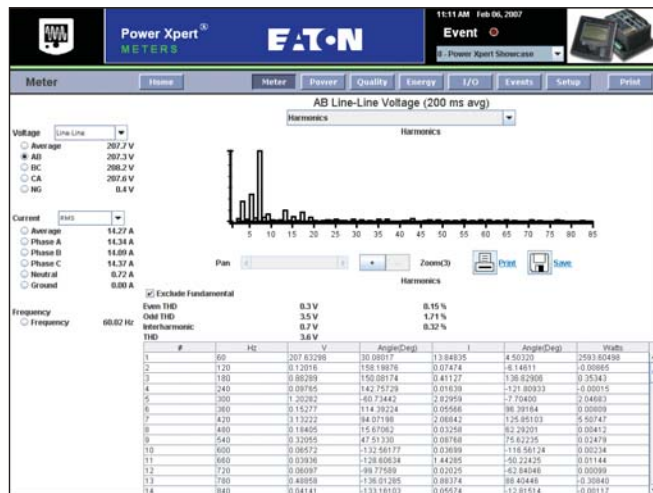
Access the meter through the Internet/Ethernet via embedded Web server

Power Xpert 4000/6000/8000 Meter offers Eaton customers a new level of accessibility to the critical information required to manage the electrical distribution system. The meter's embedded Web server includes real time circuit information in both numeric and graphical visual formats to help monitor circuit parameters such as current loading, voltage and power levels, power factor.



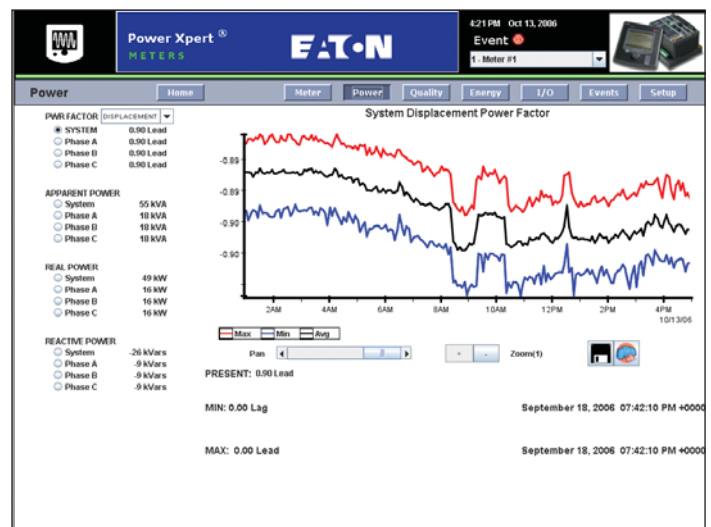
Power Xpert 4000/6000/8000 meter homepage

The Web server also provides the energy and demand readings required to help manage the cost of energy. Readings include KWh, KVARh, delivered and received and KVAh with time of use and separate status input controlled energy accumulation to account for energy during special times such as rate alert periods or stand-by generator times of operation. The Power Xpert 4000/6000/8000 Meter Web server also includes critical information regarding Power Quality such as harmonic distortion, flicker, crest factor, k-factor and more.



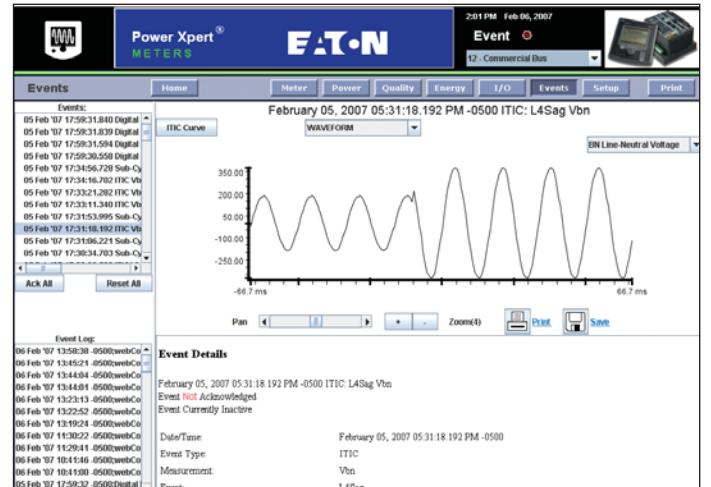
Harmonic spectral plot

The harmonic spectral plot displays both harmonics and interharmonics up to the 85th order. A detailed table also includes individual magnitudes and angles of current and voltage harmonics as well as a harmonic power calculation at each frequency. Even, Odd, Interharmonic, and total THD are displayed for diagnostic purposes.



Historical trend plot

The Power Xpert 4000/6000/8000 Meter embedded Web server supports graphical trend charts of key circuit measurements such as current, voltage, power and energy. The trend chart supports a zoom feature that allows the user to view data over a short period of 18 hours or a longer period of 48 months. The trend chart has a horizontal digital bar control to manage scrolling forward and backward through the data. Trend charts of basic readings include minimum, maximum and average readings. Trend charts of energy data also display demand values.



Disturbance recording sag/swell recording

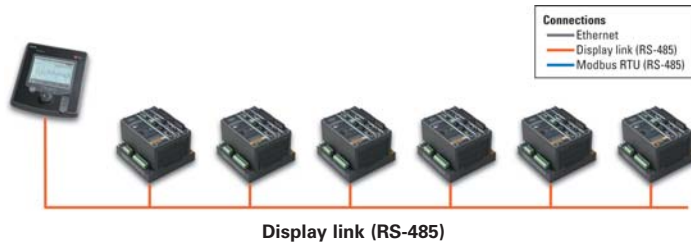
60 cycles of waveform are recorded at 256 samples per cycle including 30 cycles of pre and post event data. The Power Xpert 4000/6000/8000 Meter embedded Web server supports viewing of triggered waveforms one channel at a time including the ability to zoom and to scroll horizontally using a slider bar. Waveforms are stored in Meter's non-volatile flash memory using an industry standard Comtrade format. Waveforms can be automatically sent out by email following an event, or can be retrieved from an ftp directory structure in Meter's memory.

Configuration Examples

The Power Xpert Meters fit seamlessly into most any existing or new environments due to standard and open protocol support. The Power Xpert Architecture allows the users to build on their existing infrastructure and the flexibility to upgrade as their needs grow going forward. Configuration of the meters is simple and easy through the Web based GUI and/or the LCD Display.

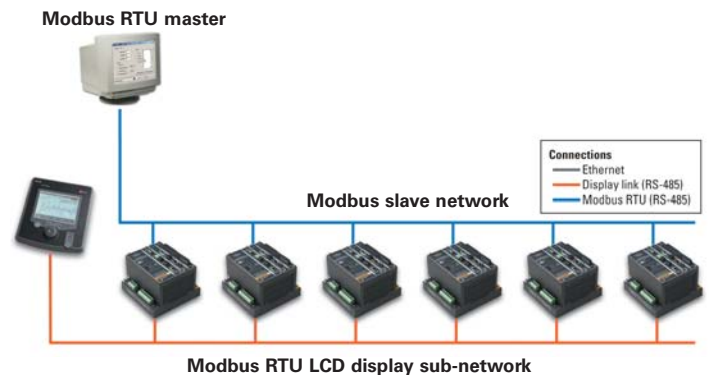
A. Display link (RS-485)

Up to 16 meters can be daisy-chained to a single Power Xpert LCD display

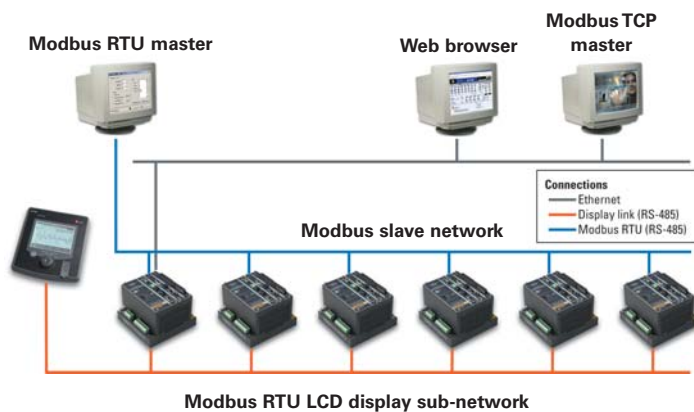


Conveniently and cost efficiently a single Power Xpert LCD Display can support up to 16 Power Xpert Meter modules. This is especially handy when several Meter modules are installed in multiple rack or switchgear lineup formations.

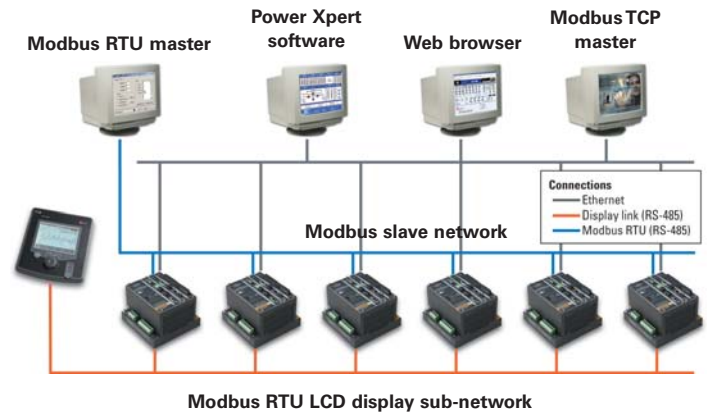
B. Modbus RTU (RS-485) — non-Web enabled



C. Web Enabled — Browser & Modbus TCP



D. Web Enabled — Advanced system functionality



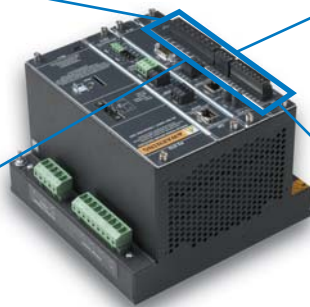
Digital I/O Card usage examples



Flow meter (pulse count)



Alarm



- Eight digital inputs
- Two solid-state digital outputs
- Three relay outputs



Rack monitoring - Open door/tamper switch



Trip and sequence of events

Features of Power Xpert 4000/6000/8000

Feature	Power Xpert 4000	Power Xpert 6000	Power Xpert 8000
GENERAL			
Embedded Web server	●	●	●
Power Quality Index (at-a-glance 'thermometer' view of power quality)	●	●	●
TOU metering support	●	●	●
Firmware flash upgrade support	●	●	●
Self-learning capability (characterizes "normal" per circuit)	●	●	●
POWER, ENERGY & DEMAND			
Voltage, current: per phase minimum, maximum, average, trend graph analysis, export, print	●	●	●
Power: power factor, apparent, real, reactive, frequency	●	●	●
Energy, demand: forward, reverse, net, sum, TOU, profile, previous month comparison, graph analysis, export, print	●	●	●
POWER QUALITY ANALYSIS			
Statistical analysis (min, max, average)	●	●	●
Sag and swell monitoring	●	●	●
Symmetrical components: zero, negative, positive	●	●	●
Low frequency transient detection and capture	●	●	●
Sampling rate, maximum samples/cycle	1024*	1024*	100,000
"Number of nines" uptime data (e.g. 6 nines=99.9999%)	●	●	●
SECURITY			
Secure 5 level user access privileges	●	●	●
COMMUNICATIONS & I/O			
Modbus TCP	●	●	●
Modbus RTU	●	●	●
HTML	●	●	●
SNMP (Simple Network Management Protocol)	●	●	●
SMTP (Simple Mail Transfer Protocol)	●	●	●
FTP (File Transfer Protocol)	●	●	●
NTP (Network Time Protocol)	●	●	●
COMTRADE file format for waveform capture export	●	●	●
Trend measurements CSV file export	●	●	●
I/O (eight digital inputs, three relay outputs, two solid state KYZ outputs)	●	●	●
TIME SYNCHRONIZATION			
NTP time synchronization up to 1 millisecond accuracy	●	●	●
GPS time synchronization up to 1 millisecond accuracy	●	●	●
LOGS			
Trend logging	●	●	●
Load profile	●	●	●
Event logging	●	●	●
MEMORY & STORAGE			
512 MB standard, 1 GB optional memory	●	●	●
HARMONICS			
Harmonics (phase angle and magnitude)	127	127	127
Delta-Sigma D/A Conversion Technology	●	●	●
Harmonics over-sampling (1024 samples per cycle)	●	●	●
Anti-alias filtering	●	●	●
HIGHLIGHTS			
Flicker calculations		●	●
Sub-cycle disturbance capturing	●	●	●
dV/dt triggers for sub-cycle oscillatory transients	●	●	●
Absolute threshold and dV/dt triggering	●	●	●
Automatic trigger setting		●	●
Automatic event severity analysis		●	●
ITIC (Information Technology Industry Council) performance curve		●	●
IMPULSIVE TRANSIENT CAPTURE & DETECTION			
6 MHz capture of impulsive transients			●
Transient capture duration: ~20 ms/6 MHz ~120 ms/1 MHz			●
Waveform recorded at 100,000 samples per cycle			●
Three-phase voltage and neutral-to-ground fast transient capture			●

* Delta-Sigma A/D oversampling rate

Available Accessories

Graphic display module

The graphic display module provides an at-a-glance view of power quality, with intuitive visual displays, statistically derived trending and red-yellow-green indicators of overall power health. In addition it has a RJ-45 Ethernet port built right into the faceplate for easy and safe meter configuration.

Communication expansion card

An optional communication expansion card supports remote communications with the onboard Web server application over your LAN/WAN, or the Internet via standard Ethernet 10/100 base-T and fiber-optic connection. Modbus is supported over TCP, RS-485 RTU and RS-232 ASCII ports.

I/O card

An external input/output card supports eight digital inputs to interface with control sensors

and transducers, two solid-state outputs, and three relay outputs that can actuate alarms and change the state of control relay contacts.

Compact flash card

A compact flash memory card provides 512 MB of onboard memory to store high-resolution captured waveforms along with all the data logging associated with standard monitoring functions.

AUX voltage input channels

The optional Voltage Auxiliary (VAUX) option provides three voltage input channels (V6, V7, V8) in addition to the standard 4 channels already built in.

To find out more about how Power Xpert next-generation meters can improve power performance for your critical systems, visit our Web site at www.eaton.com/powerxpert or contact us at 1-800-525-2000.

Graphic Display Module



Communication Expansion Card



I/O Card



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